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ORIGINAL PAPER

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Receptive Vocabulary and Cognition of Elderly People in Institutional Care

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ABSTRACT

Introduction: Basic cognitive functions such as: alertness, working memory, long term memory and perception, as well as higher levels of cognitive functions like: speech and language, decision-making and executive functions are affected by aging processes. Relations between the receptive vocabulary and cognitive functioning, and the manifestation of differences between populations of elderly people based on the primary disease is in the focus of this study. **Aim:** To examine receptive vocabulary and cognition of elderly people with: verified stroke, dementia, verified stroke and dementia, and without the manifested brain disease. **Material and Methods:** The sample consisted of 120 participants older than 65 years, living in an institution. A total of 26 variables was analyzed and classified into three groups: case history/anamnestic, receptive vocabulary assessment, and cognitive assessments. The interview with social workers, nurses and caregivers, as well as medical files were used to determine the anamnestic data. A Montreal Cognitive Assessment Scale (MoCA) was used for the assessment of cognition. In order to estimate the receptive vocabulary, Peabody Picture Vocabulary Test was used. **Results:** Mean raw score of receptive vocabulary is 161.58 (+21:58 points). The best results for cognitive assessment subjects achieved on subscales of orientation, naming, serial subtraction, and delayed recall. Discriminative analysis showed the significant difference in the development of receptive vocabulary and cognitive functioning in relation to the primary disease of elderly people. The biggest difference was between subjects without manifested brain disease (centroid = 1.900) and subjects with dementia (centroid = -1754). **Conclusion:** There is a significant difference between elderly with stroke; dementia; stroke and dementia, and elderly people without manifested

disease of the brain in the domain of receptive vocabulary and cognitive functioning. Variables of serial subtraction, standardized test results of receptive vocabulary, delayed recall, abstraction, orientation and vigilance successfully discriminate studied groups.

Keywords: stroke, dementia, PPVT-III-HR, MoCA.

1. INTRODUCTION

Language and communication skills are associated with skills in other areas of development for all individuals (1). Language, speech, voice and communication change during the life of adults (18-65 years) and elderly (over 65 years). Literature published in the last three decades documents the 'normal' selective improvements related to age, as well as a subtle decline in language, speech, voice, and communications (2). Basic cognitive functions are: alertness, working memory, long term memory and perception. Higher levels of cognitive functions are: speech and language, decision-making and executive functions (that include planning, organization, implementation and evaluation of many activities that are not seen as routine). Basic cognitive functions most affected by aging are attention and memory. Higher levels of cognitive functions such as language-processing and decision-making, are also affected by aging, but the fact is that those functions naturally lean on basic cognitive functions, and generally show a deficit to the extent to which the basic functions are impaired. Although these features are looked at separately, it is clear that they overlap in interesting and complex ways (3). Aging is a process that lasts a lifetime and it is not easy to determine when a person becomes old (4). The main cause for the changes is supposedly internal, i.e. genetic factors, or external, adverse factors (5). The weakening of language

	Mean	Standard deviation	Min.	Max.	Skewness	Kurtosis	Kolmogorov-Smirnov test
Standard value	80.28	17.03	40.00	108.00	-3.406	-0.133	*
Centil	19.28	18.84	.05	70.00	4.306	0.229	*
Age equivalent	181.38	54.59	63.00	277.00	1.430	-1.055	*
Chronologic age in months	943.10	71.64	780.00	1080.0	-1.402	-1.102	*

Table 1. Descriptive indicators of receptive vocabulary variables for all subjects. * asymmetric distribution

	Mean	Std. deviation	Min.	Max.	Skewness	Kurtosis	Kolmogorov-Smirnov test
Test connectivity	.04	.20	.00	1.00	21.032	45.430	*
Visuospatial abilities (cube)	.21	.41	.00	1.00	6.586	0.268	*
Visuospatial abilities (clock)	1.33	1.04	.00	3.00	1.858	-2.227	*
Naming	2.38	.93	.00	3.00	-6.133	1.620	*
Attention	1.72	.51	.00	2.00	-7.041	3.512	*
Vigilance	.88	.32	.00	1.00	-10.950	8.930	*
Serial subtraction	1.75	1.14	.00	3.00	-0.843	-3.296	*
Repeating sentences	1.49	.70	.00	2.00	-4.640	-0.558	*
Fluency	.26	.44	.00	1.00	5.063	-1.740	*
Abstraction	1.03	.72	.00	2.00	-0.226	-2.404	*
Delayed recall	1.68	1.49	.00	5.00	1.623	-2.531	*
Orientation	5.51	.87	2.00	6.00	-8.590	7.165	*
Total	19.10	4.65	6.00	28.00	-2.632	-0.686	*

Table 2. Descriptive indicators cognitive assessment variables for all subjects. * Asymmetric distribution

processing, (e.g. increasing difficulty in understanding spoken language or in the production of words) leads to reduced desire of older people to communicate, and can damage assessment of their language competence both to themselves and to others (6). Stroke is a rapid loss of brain function due to lack of blood supply to the brain, which can be due to ischemia (lack of blood flow caused by blockage or thrombosis) or bleeding (blood leakage) (7). People may show aphasia, dysarthria, and/or apraxia. When multiple disorders are presented, they are usually not equally manifested (e.g. severe aphasia and mild dysarthria). Many factors influence that; including the type of neurological condition, location of stroke, the extent and seriousness of the situation (8). However, communication problems do not occur isolated from other disorders. Stroke is a major cause of vascular changes and cognitive disorders worldwide (9). Cognitive disorders (CD) usually occur in acute phase of stroke, but may persist in more than half of survivors (10). The overall prevalence of CD after stroke is 81%, and there is an urgent need for their early recognition and prevention (11). CD include: attention, executive functioning, processing speed, memory, and orientation. Researches suggest that 44% of people with vascular impairment developed dementia after five years (12). Dementia is an acquired progressive degenerative syndrome that affects higher cognitive systems and processes (13). The most common types of dementia are: dementia of Alzheimer type

(50-80%), vascular dementia (20-30%), frontotemporal dementia (5-10%), dementia with Levy bodies (<5%) (14). The majority of people with dementia, if not all, have a problem with communication. Weak understanding skills are usually at the centre of this disorder and associated partly with poor working memory (15).

Patients show difficulties in finding words (anomia), deficits in understanding sentences and lack of cohesion in the discourse. Language deficits in dementia occur because of multiple cognitive impairments (16). The essential features of dementia are more cognitive deficits that include memory impairment and the presence of at least one of these signs: aphasia, apraxia, agnosia, as well as disturbance in executive functions.

2. AIM

The main aim of this study was to assess receptive vocabulary and cognitive functioning of elderly people with the following (primary) diseases: stroke; dementia; stroke and dementia; as well as those without manifested brain diseases. It is expected that there is a difference in the development of receptive vocabulary and cognitive functioning in relation to the primary disease.

F	λ	% variance	Cumulative % variance	r_c	Wilks λ	χ^2	df	p
1	2.933	89.6	89.6	0.864	0.186	185.62	39	0.0001
2	0.253	7.7	97.3	0.449	0.733	34.30	24	0.080
3	0.088	2.7	100.0	0.285	0.919	9.37	11	0.588

Table 3. The discriminative analysis of variables of receptive vocabulary and cognitive functioning for all subjects

3. MATERIAL AND METHODS

The sample of subjects consisted of elderly people, placed in institutional care in four cities of Bosnia and Herzegovina: Tuzla (Retirement Home), Mostar (Home for the Elderly), Sarajevo (Gerontology Centre) and Brčko (Nursing homes: Vesna Mićanović, Sun, Kusturica, and Onion). Subjects were divided into four groups with respect to the primary disease. In each group there were 30 subjects thereby forming a total sample of 120 people. Four subgroups were formed of elderly with verified: stroke; dementia; stroke and dementia; and without a manifested brain disease. The youngest subject was 65 and the oldest was 90 years old. The sample consisted of 15 persons who were unskilled workers (12.5%), 64 people were skilled workers (53.3%), 19 people with secondary education (15.8%), 16 persons with associate degree education (13.3%) and 6 people with bachelor degree education (5.0%). There

Variable	discriminant coefficient ^{F1;2;3}	Group	Centroid projection
Serial subtraction	0,468 ^{F1}	Stroke	1,451
Standardized test result of receptive vocabulary	0,447 ^{F1}		
Delayed recall	0,439 ^{F1}		
Apstraction	0,374 ^{F1}		
Orientation	0,329 ^{F1}	Dementia	-1,754
Vigilance	0,092 ^{F1}		
Visuospatial abilities (clock)	0,504 ^{F2}		
Visuospatial abilities (cube)	0,331 ^{F2}		
Attention	-0,327 ^{F2}	Stroke and Dementia	-1,579
Repeating sentences	-0,209 ^{F2}		
Fluency	0,436 ^{F3}	Without disease	1,900
Naming	-0,424 ^{F3}		
Connectivity test	0,342 ^{F3}		

Table 4. Most important discriminant coefficient with centroid projection on discriminant function. F1-function 1; F2- function 2; F3- function 3

was a significant difference in the proportion of subjects of individual categories based on formal education ($\chi^2 = 87.250$, $df = 4$, $p = 0.0001$), significantly more than those who were categorized as skilled laborers. The sample particles consisted of three groups: anamnestic (chronological age, gender, primary disease), estimate of their receptive dictionaries (raw result of the receptive vocabulary test, standardized value receptive test, percentile receptive test, equivalent to the normal distribution receptive test, Stanine value receptive test, age equivalent receptive test). To avoid redundancy, only standardized value tables will be displayed, percentile and age equivalent and cognitive assessment (test connectivity, visuospatial abilities (cube), visuospatial abilities (clock), naming, attention, vigilance, serial subtraction, repeating sentences, fluency, abstraction, delayed recall, orientation, total). After obtaining approval from institutions of institutional care, testing was done by three qualified examiners, from September 2014. to May 2015. The information about the subjects were received in an interview with social workers, nurses and caregivers working in institutions where the subjects live, as well as insight into medical records for the purpose of gathering the necessary medical information. After examining the medical records, it was established if the subject belongs in the group with stroke, as well as the exclusion criteria (presence of epilepsy, multiple sclerosis, psychosis, cancer and inflammatory diseases of the brain and head-trauma with fractures of the skull). After obtaining the consent from the subjects tests were individually conducted. The first testing instrument applied was the Montreal Cognitive Assessment – MoCA (17). Based on the results, subjects were assigned to the appropriate groups (with dementia or without dementia), and after that we applied the Peabody Picture Vocabulary Test – PPVT-III-HR (18). Statistical analysis was performed by SPSS. It involved the computation of basic statistical parameters, discriminative analysis and regression analysis. Statistical significance that was accepted, was for the value of $p < 0.05$.

4. RESULTS

Descriptive indicators of receptive vocabulary shown in Table 1 indicate the average raw score was 161.58 ± 21.58 points. Measures of skewness and kurtosis, expressed on z-scale, indicate expressed negative asymmetric distribution of the results. Kolmogorov-Smirnov test showed significant asymmetric distribution.

Descriptive indicators for cognitive assessment variables in Table 2 show that measures of skewness and kurtosis for all particles of cognitive assessments were extremely high where with the Kolmogorov-Smirnov test; the asymmetry of distribution was confirmed.

The best results were achieved on subscales of orientation, naming, serial subtraction and delayed recall.

With a point of establishing the existence of significance difference in the development of receptive vocabulary and cognitive functioning in relation to the primary disease discriminative analysis was used. Preliminary estimates showed that there was a distortion of normal distribution in the case of all of these variables which were accepted part of the population. It should be noted that the discriminative analysis method is quite robust in terms of normal distribution (19). Box M's test showed that there is a discrepancy in the homogeneity of variance which is not unusual given the sensitivity of this test.

The projections of centroid on discriminate function from the displayed centroid and coefficient of discrimination it is possible to gain insight on individual characteristics of subjects, the largest multivariate differences. Based on the centroid results show that the most pronounced difference between subjects without manifested disease (centroid = 1.900) and subjects with dementia (centroid = -1754). Furthermore, the most pronounced differences were between subjects with stroke (centroid = 1.451) and subjects with dementia (centroid = -1754), or subjects with a combination of stroke and dementia (centroid = -1579).

Combined with the coefficients of discrimination, it is possible to say that the subjects without disease are characterized by high scores on the sub-scales of Serial Subtraction, the Standardized test result of receptive vocabulary, Delayed Recall, Abstraction, Orientation and Vigilance.

Stroke subjects are characterized by high results on sub-scales of Serial Subtraction, Standardized test result of receptive vocabulary, Delayed Recall, Abstraction, Orientation and Vigilance, which are, however, somewhat lower than those without disease. Based on the coefficients of discrimination it is possible to say that the subjects with dementia are characterized by exceptionally low results on the sub-scales of Serial Subtraction, Standardized test result of receptive vocabulary, Delayed Recall, Abstraction, Orientation and Vigilance. Subjects with stroke and dementia are characterized by low scores on sub-scales of Serial Subtraction, Standardized test result of receptive vocabulary, Delayed Recall, Abstraction, Orientation and Vigilance, which are, however, somewhat higher than those in subjects with dementia.

5. DISCUSSION

Descriptive indicators of cognitive assessment show that best results were achieved on subscales of orientation, naming, serial subtraction and delayed recall. This is partly

in line with the results of other study where subjects have shown success in subscales: naming, orientation, and abstraction. Authors points out that the ability of attention and delayed recall is more influenced by education while visual constructional ability is more influenced by age (20). This partly coincides with the other research results where authors specified as factors that are associated with age and level of education; semantic fluency, naming, visual-constructional and executive functions (21). Viewed from the perspective of this study, it emphasized the need to monitor the results and comparison of achievements in the domains of receptive vocabulary and cognitive functioning in relation to the level of education of the elderly. Results show that the level of education is a valid predictor of success in test domains. This study also highlights the need for putting greater emphasis on working with the elderly population, which seems to be neglected and insufficient. From the displayed centroid and coefficient of discrimination can be seen that among subjects with dementia and subjects with a combination of stroke and dementia, there is no big difference. The situation was similar among subjects with stroke and subjects without the disease, where the differences were still greater than in the previous case. Results of other study show a significantly weaker performance of the so-called mini-mental status, memory, alertness/executive functions and processing speed of subjects with stroke in relation to cognitively intact subjects and those without stroke (22). The healthy subjects scored better on tests of cognitive assessment in relation to the subjects with cognitive impairments. The differences were evident on tests of vocabulary. All this leads us to the connection between the development of receptive vocabulary and cognitive functioning, and the manifestation of differences between populations based on the primary disease (23). The results of the MoCA and PPVT-III-HR are significantly related to subjects who had stroke, even when the influence of the education is controlled (24). Taking into account the presence of healthy cognition for successful linguistic communication, it is not surprising that there are lower results in the domain of receptive vocabulary in older subjects with stroke and dementia. Other study suggests that the risks of mild cognitive impairment are: older age, female gender and lower education (25). The female gender, older age, diabetes, illiteracy and low education are significantly more common in people with vascular cognitive impairment and vascular dementia, compared to cognitively intact individuals after stroke (9).

Due to the complexity of problems which a team of neurologists, speech therapists and other experts face regarding stroke and aging, and the special sensitivity, as well as very frequent neglect of the elderly, we decided to create this study. It was performed in order to contribute and to put into focus the difficulties aging and stroke brings with them, but also to bring specific findings that could help in the diagnosis, treatment, secondary prevention, and prioritize the need for speech and language, medical diagnosis and treatment. The belief remains that the results will encourage others to research topics related to the population of the elderly.

6. CONCLUSION

There is a significant difference between elderly with stroke; dementia; stroke and dementia, and elderly people

without manifested disease of the brain in the domain of receptive vocabulary and cognitive functioning. Variables of serial subtraction, standardized test results of receptive vocabulary, delayed recall, abstraction, orientation and vigilance successfully discriminate studied groups.

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